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Lectures on Physiology.

begun Nov: 15th 1791.

Gentlemen,

In entering upon the physical part of our course I feel as if I were about to enter ~~devout man ought to feel in entering~~ into a temple of the Deity. The human body contains so many marks of ineffable wisdom and power - goodness in its construction that it would be an act of impiety to enter upon the considerations of its ~~structure and~~ functions without doing homage to its divine architect. ~~(It was formed after a divine consultation in the councils of heaven). It was created in the divine image) It was and~~

The world and all its furniture (man excepted) ~~was~~ rose into existance at the ~~word of~~ single command of the great Creator. But ~~[illegible]~~ this was not the case with ~~man~~ the body of man. It was formed after a divine consultation in ~~the Council~~ Court of heaven. The Creator of the Universe descends from his throne, to chuse and modify with his own hands the clay ~~with~~ from which the first man was formed. ~~[The person of his Son is supposed to be the perfect model from which the body of man was copied]~~ ~~and the~~ ~~His~~ ~~breath of the most high~~ He imparted to him ~~gave~~ ~~was~~ ~~to~~ the first pulse ~~to~~ ~~origin~~ ~~of his~~ of life. ~~and the voices~~

Nor did the ceremony of his creation end here. — ~~for the space~~ for it was not till man was formed, that the Creator ~~[illegible]~~ ~~Creator was delighted with the~~

In ~~contemplating~~ approaching this ~~human body and~~ master peice of divine workmanship, we are first struck with its exact form. In this particular he is distinguished from every other animal upon the Globe. Nor is this, ~~from the result of~~ acquired by any improvement in the exercise of his rea-soning faculties as some modern ~~sceptics~~ infidels have supposed. ~~He was made to walk upon two feet, in paradise were upon two feet.~~ ~~first ornaments~~ The shape, of his face - the position of his eyes - the form & texture of the vertebra, - the greater length of his thighs and legs than his arms, - the elevation of his hips above his shoul-ders when he attempts to walk ~~upon~~ like a Quadruped, & the shape of his hands, - and of his feet, all indicate that he was made to walk exclusively upon his feet, & prove that his first ornaments in paradise were upon them. ~~in~~

The next thing that strikes us in

surveyed the workmanship of his ~~[illegible]~~ hands, with complacency, and pronounced them to be ~~[illegible]~~ "very good". —

If revelation had taught us no more of the ~~[illegible]~~ dignity & excellency of the human body than what is recorded by the Jewish legislator ~~[illegible]~~, it would be sufficient to recommend ~~the~~ an attentive examination of the ~~its~~ structure & uses of all its parts to our ~~[illegible]~~ — his ability to lie on his back, which no other animal does, & ~~his~~ to sit with his thighs, horizontal, & his legs perpendicular, & ~~his~~ his feet upon the ground — the soles of his feet ~~[illegible]~~ dignified by being ~~[illegible]~~ by the footsteps of God — that it has been consecrated and even designated by the name of a temple — for a residence of the divine ~~[illegible]~~ & that tho' it must submit to death, yet that

viewing the human body is the symmetry ~~and just~~ or just proportions of ~~his~~ all the parts which compose it, to each other. ~~—a~~ We cease to admire them, only be=
=cause they are so familiar to us. To the eye of a Critic, ~~in~~ the beauty of form ~~be~~ in the human figure is a constant source of pleasure. It was ~~one~~ remarkably so to the celebrated Hogarth who has left it upon record in his treatise upon the line of beauty, ~~who~~ that man is the most beautiful creature upon the face of the earth. It is true there are frequent deviations from symmetry and beauty in the figures of men and women in every part of the world, and in some countries more than in others. ~~In height~~ From five ~~to~~ feet to inches to 6 feet are supposed to constitute the most agreeable height. The arms when extended, equalling ~~this height~~

all the elements & atoms of which it is composed, after ~~mouldering~~ mingling with ~~its~~ their native dust for years or ages, shall again be reunited, ~~and reanimated~~ that its departed life shall be restored – and that it shall live again in health and beauty – and continue to be the object of admiration and praise to all intelligent beings as long as God himself shall exist.

In contemplating the human body in this light the subject of our physiological lectures rises into the highest degrees of importance. we are about to ~~consider the functions~~ begin a study which ~~and laws of the first book of Creation~~ ~~and~~ will not end in time, but which may perhaps furnish employment for

the height of the body - the diameter of the body around the lower parts of the breast ~~equalling~~ and a line from the pubis to the heel equalling half the height the body, are supposed to constitute perfection in the proportions of the different parts of the body to each other. —

But what is the exact form - ? and what is the Dignity of the body and its limbs, — compared with "the human face divine" to use the words of Milton? In this, man ~~he pro-~~ discovers ~~claims~~ his preeminence over all other animal, & to this, chiefly he owes his dominion over them. ~~For the dignity - beauty, and commanding aspect of his face - he is indebted to the mind, which pervades ~~& animates~~ every part of it and which is an essential part of his nature.)~~

"But what is this all - that entitles the human body to our notice & admiration? — If it were, - ~~a statue of brass or marble~~ It would be but - a little elevated

your intellects, millions of ages hence. ~~in~~ ~~these~~ Dr Cheyne after ~~much labor~~ has called man an infi=nitesimal part of God. In the view I have taken of ~~him~~ the human body, this account of it may be just. ~~The~~ ~~It~~ is possible, ~~it~~ man may continue to be an unfolding series of mysteries to himself, ~~to all eternity~~ as long as he exists. ~~If~~ I am so satisfied with the profound ~~so~~ ~~unsc~~ inexhaustable riches ~~to~~ of know=ledge that are contained in the human body, that I think it probable that a single bone of the ear or a single humor of the eye or a single particle of blood, may furnish materials for investigation - discovery and adoration ~~to~~ ~~throughout the~~ to all eternity.

go on to p: 7

In entering upon this Subject Gent. I am ~~not prepared thus publicly~~ sure you will pardon me while

above a statue of brass or marble. But with the neat form - the just proportion of parts - and with its beautiful face, - it possesses locomotive powers - it moves from place to place - apparently without an impulse; ~~&~~ it feels - of course it possesses animal life - but it does more, it perceives, - it judges, - it combines ideas, it reasons, - ~~or in a words it thinks~~ - Of course it possesses human life - that is - ~~the~~ a ~~living~~ thinking principle called mind united in a human body. On ~~this life~~ the presence of this animal & rational life, depend all the functions of the body, and the operations of the mind. It becomes therefore to begin our physiological ~~labors~~ inquiries by first inquiring into the cause of the phenomena of life. The ~~will~~ subject is highly important ~~subject~~, and ~~leads~~ which not only to the explanation of many of the functions of the body & mind but to a discovery of the cause & cure of most of the diseases of the human body that are under the power of medicine.

Begin with p 875 =

~~to declare that any hopes of success in the difficult business before me are derived chiefly from the hope that~~ I ~~to~~ express a devout wish that, that divine Being who inspired the builders of Solomon's temple with a mechanical Spirit - who taught the fingers of David the art of war - and who in all ages and countries has manifested ~~imparts knowledge to the simple~~ his Sovereign goodness by imparting knowledge to the simple - will guide me ~~thro~~ the labyrynth that is before me, and enable me so to discharge the task I have undertaken, that no one mistake may fall ~~from~~ me that shall ever lead to the least injury of any of his creatures, but as far as possible to their health

V The Order I have chosen is different from any that is to be met with in books. You will find it in a syllabus which I have published at Wm B Bo ohstore.

— ~~The~~ It embraces as you will see several subjects not commonly introduced into a course of physiology — particularly the faculties & operations of the mind. These will lead us occasionally to discuss ~~moral~~ — metaphysical — moral & even ~~metaphysical~~ theological subjects. ~~all~~ However ~~thorny~~ these questions may be, we must approach & handle them, for they are intimately & necessarily connected with the functions & laws of the animal economy. ~~Truth is our object~~ Perhaps it is because so

comfort and happiness. ~~7~~

My first object in contemplating the subject of these lectures was to find out ~~the most~~ a natural & agreeable order. ~~in~~ The arrangement of Dr Haller - Dr Cullen - ~~on~~ Dr Gregory - and Dr Duncan appears in many instances to be wholly artificial. ~~They~~ Some of them begin with an inquiry into the chemical properties of animal matters - ~~Others~~ others begin with the dead body, and consider its functions in the order in which they are unfolded by the anatomical knife, - while One of them begins with the fluids as if they occupied the first rank, ~~or~~ in the ~~Study of~~ body, or obtruded themselves first upon the eye, & observation of a Physiologist.

Physicians have hitherto been so ignorant of these subjects, or so ~~timid~~ overawed by the opinions of the Christian churches in deciding upon them, that Physiology & medicine have ~~not~~ so long been obscure, & conjectural sciences. — go to p. 11.

[For a while I felt myself embarrassed by all the arrangements which I have mentioned, ~~arranged~~. Nor could I ~~to~~ deliver myself from them ~~prejudice whilst~~ till I suspended for a while all that I had known concerning them, and after imagining myself for a few minutes a tenant of another globe, or a being of another species, I suddenly darted upon my subject, and seized upon what I conceive to be a natural order in treating upon the functions ~~and~~ of the human body. – The first thing that occured to me was the vital force – the motion – and the heat of the human body – or in other words animal life. Upon approaching this

beautiful & striking figure - I perceived y: it possessed certain avenues of knowledge called senses - ~~upon~~ I found upon inquiry that he possessed intelligence - and speech - which distinguished him in an eminent degree from all the animals that surrounded him, - amazed at what I ~~had seen~~ saw! I began to converse with him, and inquired into the history of his origin - his means of subsistence - and the great causes upon which his life - ~~and~~ & actions both of body and mind depended. He obeyed my inquiry, and gave me an account of every thing he knew with respect to himself. I did not inquire whether he obtained his knowledge by revelation or from the dissection of the living bodies of brutes, or ~~bones~~ of the dead bodies

of creatures of his own species, but his information as far as he knew was satisfactory — ~~he~~ I imagine that ~~told~~ me that the first motion of life was the immediate gift of God, but that it had ever since been kept up by the action of certain bodies called Stimuli upon it — that)

After having obtained as much information from the living subject of our physiological inquiries as was possible, I proceeded next in my imagination to examine the internal structure of ~~the~~ a dead body, ~~and~~ by means of dissection, — maceration — and microscopical ~~the~~ observations. ~~To the~~ To the knowledge obtained in this way, I added all that I could collect from experiments

~~This will lead me to treat of the~~
~~nature of the brain~~

V The order I have chosen for these lectures
for the first thing that strikes us in con-
to be perfectly natural. Go to p: 15 V
=templating the human body is its life.
~~in treating upon this subject~~ This
important subject you will find discussed
in 3 lectures which I have published
in compliance with the request of my pupils

made upon brute animals in their living state. Having ~~this~~ finished this business, I felt my curiosity excited to know what ~~were~~ was ~~the component parts~~ ~~most~~ ~~parts~~ ~~material~~ ~~of the different~~ the nature of that matter which composed the human body, and this I found I discovered by means of a natural & chemical analysis of the animal solids and fluids. — Agreeably to this impression upon my mind I shall proceed in the following order.

1 I shall inquire into the cause of animal life. — Under this head I shall consider ~~the~~ its different degrees as exemplified in

I shall next proceed to treat of Animal heat - of Respiration - and of all the ~~Other Questions contained in the Syllabus~~ Other physiological Questions as nearly as possible according to the order in which they are arranged in our Syllabus. —

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last year. Permit me gentlemen to recommend them to your immediate & attentive perusal. They contain the foundation of all the principles of medicine which will be delivered during our present Course. I shall often refer to them, & frequently apply them to the subjects which are before us. — ~~The next subject~~ I have believed the doctrines contained in them to be true above 30 years, but the candid reception they have met with the public, and the assent which they obtained from many respectable & unprejudiced Physicians

~~Under this head, I shall treat of the functions of the Brain.~~

the sleeping ~~& waking~~ state, and its different stages, as exemplified in the fœtal - infant - youthful - middle - & declining states of life in different states of society - diff^t climates & diff^t animals. also into the state of life in certain diseases -

2. As one of the remote causes of life, ~~considered~~ I shall inquire into the causes of animal heat. as the other means of animal life

3 I shall inquire into the nature and laws of the nervous system. as a

4 the means of life, I shall consider sensation as extended over the whole body, and subdivided into seeing - hearing - smelling - tasting - & the sense of touch. as a

5 means I shall consider the ~~nature~~ nature of aliment - digestion & sanguification

6 I shall consider the circulation

have served to confirm me in my belief of them. ~~Passing by them by upon the present subject~~ Taking it for granted therefore that you ~~admit~~ will admit respect life ~~to be the effect~~

~~when I have treated of~~

~~To lastly obtaining~~ each of these, which belong to ~~men~~ the Species generally, I shall speak of those peculiarities in the female constitution in wch. it differs from the male - & lastly deliver some observations upon generation. I shall say nothing as the decay & dissolution of the body in old age, or death in my system of Physiology, - for this belongs altogether to the Pathology. -

~~of~~ in which I include further above motion & thought) to be the effect of impressions made upon the body, ~~and wholly~~ I shall proceed to the next subject mentioned in our Syllabus viz animal heat go to No 3. p. 131. X

of the blood - Respiration, Speech & Secretion.

- 7 I shall consider the excretions.

8 I shall inquire into the nature & uses of the lymphatic system.

9 - ~~Then~~ Having finished these subjects I shall inquire into the spontaneous & chemical analysis of all the fluids & solids of ye body.

You must easily perceive how ye some knowledge in anatomy is presupposed in each of these inquiries. It would require digressions to describe the structure of every part whose functions are to be considered, that would destroy the order I have laid down, and render them perhaps less intelligible & agreeable. ~~Since~~ Besides you will

I need not tell you that this is a most important subject - for the end of all the studies & business of a Physician is to preserve life, & to restore it, when suspended - and this cannot be done perfectly untill we know perfectly in what life consists.

By animal life as applied to the human species I understand - sensation - motion & thought - ~~cals~~ ally of which are to be our subjects of present inquiries. The three when united compose perfect life - but there may be life without thought, or even sensation. It is in its most imperfect state when it consists simply of motion.

a heat

receive anatomical instruction from another Chair under a thousand Advantages above what I am able to give you.

1. Principles of Animal Life. In ~~considering~~ conducting these ~~inquiries~~ I shall first assume it as a fact, that every part of the human body possesses Sensibility, or irritability, or both of them. By Sensibility I mean a power of ~~[illegible]~~ having sensation excited from the action of ~~[illegible]~~ impressions. By Irritability I mean that property in the human body which is capable of having motion excited in it by the action of impressions. This property has been called contractility - mobility ~~and~~ stimulability & Excitability.

2. I assume as a fact that the ~~those things being granted, so~~

Whole human body is ~~as~~ so formed & connected that impressions made in the healthy state upon one part excite sensation, or motion or both, in every other part of the body. ~~This capacity of receiving~~ From this view of it, it ~~it~~ appears to be ~~sensation & motion is the body~~ is an Unit, - One and indivisible. Its capacity of receiving sensation & motion is

1.

~~Now to Observe, that the sensibility, and stimulability of the body~~ is variously extended and modified by means of w.h are called the Senses. These are y avenues of certain external impressions which act upon those parts of the body which are the subjects of motion. But the Sensibility of the body is not confined to its external surface, nor is motion excited only by external impression. There are certain impressions communicated by causes which act upon the internal parts of the body, & which are essential to its ~~essential~~ healthy state; Each of which shall be mentioned in order. —

~~Life then appears to be found~~

I proceed 3ly ~~further~~ to add that life depends upon the action ~~upon~~ of certain stimuli upon the sensibility, and ~~stimulus~~ contractility which are thus extended in diffl degrees over many ~~many~~ parts ~~of~~ of the body. These stimuli are as necessary to its existence & ~~[illegible]~~ preservation, as air is to flame. — It is to use the words of Dr Brown "a forced state". ~~This~~ I say the words of Dr Brown, for ~~it was~~ the opinion was first taught by Dr Cullen in the year 1766, and ~~taught~~ detailed by me ~~publishing~~ ~~delivered~~ ~~publishing~~ ~~[illegible]~~ in this school ~~[illegible]~~ above ~~twenty~~ years ago. ~~[illegible]~~

It is true Dr Cullen afterwards deserted the opinion, but it is equally true I never did, and the belief of it

Consonant to this opinion Dr Cullen expresses himself in one of his clinical lectures delivered in the same year in the following words "A living animal system is a tremulous oscillatory mass of matter." Med. Journal:

"Whether the stimulability, or Excitability of the system be a quality of animal matter, or a substance as Dr Gisternes supposes, is a matter of little consequence to our present inquiries. The latter opinion has always appeared to me to be the most probable.

has been the foundation of many opinions and modes of practice in medicine which I have since adopted. If it were necessary I could produce the notes of a lecture composed in the year 1771, in which are the following words, copied from Dr Cullen's Institutes. "The human body is not an automaton - or self moving machine - but is kept alive & in motion by the constant action of stimuli upon it."

yes - Gent: the action of ye brain - the contraction of every muscular fibre - the ~~systole &~~ diastole & systole of ye heart, - the pulsation of the arteries, - the peristaltic motion of ye bowels, - the absorbing power of ye lymphatics - - secretion & excretion - ~~vision~~ hearing -

& all of which arrange them-
selves under two heads. Viz: Desire
& Aversion. The former inclose
hope, love, joy, ambition - ~~joy~~ and
avarice - the latter, anger, fear,
hatred, malice, envy & the like.
of each of which I shall treat
in order.

seeing - smelling - taste - & the sense of touch, nay more - thought itself all depend upon the action of stimulia upon organs of sense & motion.

These stimuli are external - and internal. The external are - light - sound - odors - heat and pure air & the reflected stimuli - means of exercise.

The internal stimuli are food - drinks chyle - the blood - a certain tension of the glands which contain secreted liquors. - the reflected exercises of the Understanding & of certain passions & emotions of the mind. such as hope - love - joy - anger - ambition aversion - hatred - avarice - & envie &c of each of which I shall treat in the order in which I have mentioned them.

1 of the external stimuli. The first of these is light. It is remarkable

that ~~the first man~~ was not brought into existence untill ~~the~~ all the luminaries of heaven were created. ~~to~~ The therefore awakened in a flare of light - nor was he insensible of ~~a~~ its efficacy upon his system according to the sublime ideas of Milton upon this subject. - Light it has been demonstrated consists of particles of matter. Its ~~action~~ stimulus is excited ~~felt~~ principally upon the organ of Vision. Its influence grant upon animal life is feeble compared with some of the other stimuli to be mentioned hereafter, but it has its proportion of force. Sleep as I shall say hereafter in one respect is a tendency to death, now ~~light~~ the Absence of

light we know invites to sleep, and the ~~[illegible]~~ restoration of it, produces a tendency to life, or a waking state. The late Mr. Rittenhouse informed me, ~~[illegible]~~ that for many years, he had constantly awoke with the light, both in summer and winter. Its influence on the animal spirits strongly ~~[illegible]~~ demonstrates its connection with the principle of life. Who has not felt his spirits rise & fall with the presence or absence, of the sun, or even with the interposition or passage of a cloud across his rays? The celebrated Mr Stuart – one of the greatest travellers in the world informed me, ~~that~~ in one of his ~~late~~ ~~[illegible]~~ visits to our city, that he

V The influence of the rays of the sun upon certain diseases (as I shall say hereafter) is still more remarkable.

There are two facts upon the subject of light which should not be omitted in this place. Fish putrify sooner in the west Indies when exposed to moonlight than when kept (in equal circumstances) in a dark place. Dr Rush informed me that oysters caught in ye moon light nights in N Carolina never keep so long as those which were taken at other times.

+ during the action of light on them that they discharge ye dephlogt^d air.

he had spent these summer months in Lapland in the latitude of 69° ~~at~~ during which time the sun was seldom out of sight. ~~and its light rarely de-~~ ~~ceiv~~ ~~the~~ He ~~felt~~ enjoyed he said during this period an uncommon degree of health ~~his~~ spirits, which he ascribed chiefly to the constantly invigorating influence of light. These facts will not surprise us when we attend to the influence of light upon vegetables ~~life~~. Some of them lose y^r color by ~~growing~~ being deprived of light - and all of them - show ~~inclin~~ a particular ~~ftn~~ to it in the direction of y^r flowers in those cases where the light could not be supposed to have the least mixture of heat. ~~nor~~ is this all. It is

2 Sound has an extensive influence upon human life. — Conversation is a ~~constant~~ fruitful source of Sound — but this is less constant than many others. The ~~sound~~ current of Winds — the passage of insects thro' the air — and even the growth of vegetables are all attended with an emission of Sound, and tho' to us they have, from habit become imperceptible, yet there are certain animals ~~to whom these~~ whose organs of hearing they strike with the force of thunder. — The existence of these Sounds is evident from the reports of persons who have ascended ~~the~~ a mile or two ~~from~~ from the earth in Balloons. They

tell us that the filum in the upper regions of the air is awful. Let it not be ~~said~~ used here – that these sounds excite ~~no~~ no sensations on the body or perceptions in the mind. It is not necessary that this should be the ~~cause~~ case for them to produce motion in the ear, & thro' it, upon the whole system. There are an hundred impressions upon the body that from habit, are not attended with sensation, or consciousness. – The food we take, stimulates our stomachs – and the blood stimulates ~~every~~ in its course a thousand moving fibres – and yet who in a healthy state ever felt a sensation or consciousness from either of them? It is possible every sound

I have mentioned, was one accomp.d
with sensation & consciousness, and
that ~~it has~~ both have been lost by
habit in the same manner that
we have lost both in the act of walking,
for in this exercise, we are so capable of
sensation & consciousness from other
things, ~~and to such~~ so, as to pass
considerable distances without any
more knowledge of them, than we have
of what passes in our sleep. It is
unfortunate for this, & many other
parts of physiological knowledge y.t
we forget what has passed in our
minds - the first two ~~for~~ or three ~~first~~
years of our ~~lof~~ lives. - ~~I have seen~~
could an infant of a year ~~of~~ old

discover to us, the manner in which it acquired its first ideas, & the progress of its knowledge with the evolution of its faculties, it would relieve us from a number of difficulties & controversies ~~in so~~ upon this subject. — I suspect however that much more than we now know, might be extracted from them if philosophers would now & then visit a nursery and examine the origin & progress of impression — sensation, and perception upon their bodies & minds as discovered by their little actions, all of which probably have a meaning as determined, as any of the actions of men or women. —

The influence of sounds of a certain kind in encreasing life, or producing

a high degree of excitement will not be denied. — Fear produces debility, which is a tendency a death — now sound we know obviates this debility, and thus disposes to life. The school boy, and the clown whistle or sing as they pass ~~above~~ by a country church yard — and the Soldiers feels his ~~life~~ departing life recalled in the onset of a battle by the noise of the fife and of the Poets "Spirit stirring drum". — Intoxication is a higher degree of life than is natural. — Now Sound we know will produce this with very moderate portions of liquor — hence we find men more easily intoxicated at public entertainments where there is music & loud talking & hallowing,

V I shall dismiss this head by an observation which applies ~~both~~ to the stimulus of light as well as sound, & that is that life is in a more languid state in persons who have lost their sight & hearing than in others — hence their dullness and want of spirits in company + — have an influence upon anim: life.

VI 3 Odors — Hence the country where gently stimulating Odors abound is more healthy than cities. Milton was sensible of their effect on life — hence the following lines. go on to p: 29 no 4

+ I wish the effect of Sound upon anim: mal life to be remembered, for I shall mention it hereafter as a remedy for the weak state of life in certain diseases, more particularly in the form of Music.

than in private companies where there are so auxillary stimuli added to the stimulus of the Wine. —

The next external stimulus is

6th Exercise. — This like thought is a reflected stimulus. The necessity of motion to life is clearly indicated by the exercise of dressing a garden being imposed upon the first man before, & by the labor of cultivating the earth being inflicted upon him after his fall. — They both act first indirectly upon the system thro' the medium of the arteries ~~system thro'~~ which they enable to propel the blood — and 2ly they act directly on the nerves & brain. But we are not to suppose that the muscular fibres are moved by exercise & labor alone. They are

4

constantly stimulated by the different positions of the body, ~~all of which~~ such as ~~[illegible]~~ standing - sitting - & lying on the sides all of which require the action of a certain number of muscles. —

go to p: 32

4 Heat is an active power in the preservation of animal life. It is external & internal. The Sun is the source of external heat. The human body by a power & in a way to be considered hereafter furnishes the internal heat. Nothing shews the necessity of heat more upon human life, than the decay ~~or extinction~~ of it which takes place in its abstraction, or under the influence of cold. ~~[illegible]~~

This is obvious in those animals ~~which sleepers~~ which become torpid during the winter, and revive under the invigorating influence of the sun. It is true - ~~the~~ life in man suffers less from the abstraction of heat, but it is probably because the absence of it is supplied by an increase in the action of other stimuli. —

5 Pure air acts as a ~~lep~~ stimulus upon the system thro' the medium of the Lungs. / the nature of this air will be explained in the lectures upon Chem. / - I shall have occasion to speak of its action when I treat of animal heat. - I shall only ~~add~~ remark here that Dr Godwin ascribes the circulation of the ~~whole~~ blood

wholly to the absorption of this air in the lungs, & its subsequent action on the heart. Does the external air act upon any other part of ye body besides the lungs? — It is probable it does, and y^t we lose our sensation & conscious-ness of it by habit. It is certain children cry for the most part as soon as they come into the world. May not this be owing to the sudden impression of air upon ye tender surface of ye bodies? — and may not ye red color of ye bodies be owing to an irritation on the surface of the body excited by the stimulus of the air? — It is certain the air has a power of acting upon animal fibres, — for who has not observed a rose, or even the skin when denudated

v The action of air upon the alimentary canal is less doubtfull. A portion of ~~them~~ it appears to be ~~always~~ necessarily present in the bowels in the healthy state. It is certain impure or morbid air acts upon the stomach & bowels, hence the sickness & commotions we observe in them in the first stage of ~~in~~ contagious fevers.

return to p 28.

by the removal of the Cuticle to be greatly affected by it.[2] —[v]

we proceed next to consider the Internal Stimuli which produce or support Animal life. — These are

1 Food. This acts in the following ways. 1 upon the tongue. The sensibility of this ~~in its mastication~~ organ is wonderfully connected with that of the whole system — hence we find the body invigorated by aliment as soon as it comes in contact with the tongue. ~~The British Officers fact.~~ 2 by mastication. This moves a number of muscles ~~nearly~~ situated near the brain & heart, & of course imparts a certain impetus to y.[m] 3 by Deglutition which likewise acts upon the vessels which convey blood to the brain. By 4 The

food which acts by its quantity & quality in the stomach. By its quantity in distending the stomach & thus stimulating the adjoining irritable & vital parts. – This distention is essential in some measure to the excitement or healthy state ~~due vitality~~ of the system. It is produced in man by vegetables which afford but little nourishment, or by drinks. In ~~Horses by~~ it is produced in nearly the same manner. A horse will ~~fall away~~ lose his strength on grain, unless he be fed at the same time with hay. 16 lbs. of it a day are necessary to keep up y. distention. – But food acts by its quality. A moderate quantity of aliment of an acrid or stimulating nature supplies the place, of distention from quantity. – An onion will support

a longing Highlander on ye hills of Scotland for four & twenty hours. a moderate quantity of salted meat or a few ounces of sugar have supplied the want of pounds of life stimulating food. Even indigestible substances ~~which~~ which remain for days, or perhaps weeks in the stomach exert a stimulus there which has an influence on animal life – It is in this way, I suppose, the tops of briars and the twigs of trees devoid not only of nourishing matter, but even of succulency or juices, support the camel in his journeys thro' the deserts of the Eastern Countries. The chips of cedar ~~ta~~ moistened with water have supported horses for

two or three weeks, & the indigestable cover of an old Bible once supported a dog for 20 days. 5 Food stimulates by the process of digestion. I hope to prove hereafter that this Animal process is carried on fermentation in ye human Stomach. — Now in the act of ferm^n there is an extrication of heat & air both of which we know are of a stimulating nature.

Drinks when they consist of fermented or distilled liquors stimulate from their quality — but when they consist of water, or of mild impregnations of water they act only by Distention. —

2 The Chyle acts upon ye lacteals — mesenteric glands & thoracic Duct in its passage thro' them, and it is probable

that its first mixture with the blood in the subclavian vein, & its first action on the heart may be attended with peculiar stimulating effects. –

3 The Blood is the next internal stimulus. It has been disputed whether it acts by its quality, or only from distention. If we admit the doctrine of specific stimuli, the ~~difficulty~~ question is solved at once. For my part I see no more difficulty in admitting y^t the blood may possess a power of ~~acting~~ stimulating the heart & arteries, & no other part of the body, than that light shd. exclusively stimulate the retina, or dephlogisticated air, the lungs. But if this be denied, the stimulus of distention will account for a very extensive stimul^g action of blood upon ye system.

1 The effects of this stimulus appear in the resistance of the female constitution during pregnancy, to all the causes of death. It is sometimes so great as to prevent Sleep altogether for several weeks before delivery. How seldom do we hear of death in pregnant women even from the most malignant fevers. — Even the plague itself is arrested in its progress towards the destruction of the body by pregnancy, — hence in this,

It pervades every part of the body by means of blood vessels - and an uncommon portion of its stimulus is spent upon the heart & brain. It is remarkable that the blood is not lodged in large vessels in those who die of hung: & a certain tension of the glands and of other parts of the body contributes to support animal life. This is evident in the fulness of the alimentary canal, of the urinal vesicles in males, and in the distention of the Uterus in female subjects. They both increase the quantity or degree of life, ~~and life and~~ the faintness which follows child birth is a tendency to death, & this is the consequence of the abstraction of the stimulus of distention. In Animals which die of hunger - the gall bladder is found filled with bile - probably this may be a provision of nature to contract by the stimulus of distention

as well as in other malignant fevers, natural delivery, or abortion always precedes death.

V Before I proceed to speak of the influence of each of the faculties of the mind upon animal life it will be necessary to premise, that they act by reflection only on the body, i.e they are always first excited into action by the impressions upon the body, which have been mentioned, after which they react upon the body. This should surprize us no more than the actions of the body upon matters that are external to it; for these are perpetually excited by impressions upon the different senses. I am aware that this passive view of the mind is not a popular one, with orthodox Physicians or Divines. but the objections to it are founded in prejudice ~~[illegible]~~ in the former, & in a mistaken zeal for a

the tendency to death which arises from the abstraction of the stimulus of aliment.

5th The exercise of the Understanding & of the passions is a powerful stimulus, ~~to~~ acts with considerable force in supporting the influence of pulse animal life. — 5 of the Understanding. Thinking belongs to this power of the mind. Now thinking is a stimulus. — It promotes circulation — secretion — and even quickens the pulse. When used in moderation it not only supports, but adds to the duration of human life. Hence the longevity of men of great ~~thou~~ & active Understandings. Idiots are seldom long lived. The Cretins in Valais in Switzerland a race of idiots, travellers tell us all die young. Common language justifies the opinion of the stimulus of the

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where most mind - most capacity of life & longevity. Indians seldom so long lived as civilized people - Literary men cateris paribus - long lived. ——

+ The impetus of a new thought coming suddenly on the mind has in one instance that came within my knowledge been so great, as to produce a temporary giddiness of the head.

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a speculative opinion in religion by the ~~other~~ latter class of men. This ~~interests~~ & honors ~~of religion, I hope will soon appear on our side of the question~~) Opinion is – that if we admit the mind to be wholly passive, and ~~[illegible]~~ altogether dependant on ~~the~~ impressions received thro' the body for the exercise of all its ~~numerous~~ wonderful faculties, and numerous operations, it will follow that the Soul can exist only in a state of Connection with the body, and that ~~of~~ course the Soul must ~~cease to exist~~ remain in ~~the body~~ in ~~a state~~ a stupid state ~~wit~~

Understanding on the brain - for we say of dull men "that they have hardly ideas enough to keep them awake." + by 2 The stimulus of the Passions is less equivocal, because more observable. - They are divided into ~~such as are good, and such as are evil~~ passions properly so called & emotions ~~& propensities~~. ~~The passions which have good for their Objects are hope & desire~~ ~~or habition~~, The Passions are attended with desire or aversion, & have for their Objects distant & known good or evil. see p. 19. ~~They are~~ Emotions are without desire, and arise from present good or evil. Propensities are desires of a distant, but unknown good. These Passions & Emotions ~~are hope & desire~~ are either stimulating or sedative. Our business at present is only to take notice

between the death & resurrection of the body. I shall not decide upon this question not only but I shall briefly mention the argts for & agt it. Those who urge this Argument admit the operations of divine power, but they discover an ignorance of many analogies in nature, & particularly in the Animal Oeconomy, which may serve to shew that the argument has no force. ~~It is easy to conceive that of Jehovah fully believing in a separate state of es~~ It is said on ~~the advocates for a separate state~~ ~~impressions of the two former opinions~~ ~~is easy to conceive~~ that a new vehicle of impressions may be ~~communicated~~ given to the soul as soon as it leaves the body, or that such substitutes for a body may take place, as we observe to take place in the body, when it is deprived of any of its customary avenues of impression. E.g: Haw Boerhaave the nephew of the celebrated Dr Boerhaave, ~~was~~ lost his hearing - but

of those which are stimulating.
They are hope - love - lust - Ambition - the
moral powers of conscience & the moral faculty;
envy - malice - and avarice. The
Emotions are joy & anger. ~~The passion~~ Fear &c -
~~-sities are a desire of the pleasing~~ the
~~embarrass pleas~~ In the original
Constitution of human nature ~~man~~
the body
was made to be stimulated only by
the passions and emotions which
have moral good for their object.
We were
~~The was~~ made always to hope
always always
- to love & to be joyful. But melan-
-choly experience teaches us that this
at the case.
is not ~~the~~ present ~~Character of man.~~
the supreme creator
But ~~God~~ cannot be ~~disap~~ frustrated
in any of his works by man;

this sense was supplied by his whole body being converted into an organ of hearing. ~~By means~~ This the medium of his feet, he could tell when any thing fell on the floor, & ~~by putting~~ this the medium of his hand placed on the shoulder of a person when speaking, he could tell every word he said. — Several other instances of a translation of the senses to foreign parts of the body ~~shall be~~ have been mentioned. ~~Lastly~~ ~~after~~ Again - certain vegetables require earth - water - & air for their growth - but it is well known that the same vegetables will grow in water without earth - & others of them - in air without water. These facts it is said make it probable that the soul may exist and receive impressions in a seperate state from the body. ~~The~~ pleasures & its pains in this state, must necessarily be imperfect, & hence the necessity of

He has therefore 41 kindly connected
~~It belongs to Man to extract evil~~
~~from good, but God has extracted~~
~~good out of evil, and by connecting~~
a stimulus with evil passions, &
emotions, & has thus rendered them
subservient to the purposes of pro-
-moting animal life; hence anger-
malice - ambition - ~~&~~ avarice - and
lust supply in a certain degree the
place of hope - ~~or~~ Darwin's fact - Dr love & joy. It
Hartley's association -
is true they are like the stimulus
of a dislocated bone, compared
with the ~~gentle~~ action of antago-
-nist muscles stretched over bones
~~and~~ gently moving in their natural
sockets, ~~but~~ or like the stimulus

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A decay of the eye sight in old age is the beginning of death. Spectacles furnish a new medium for the transmission of light to the eyes by which departing life & light are restored to them. In like manner, may not new mediums of sensation & life be imparted to the soul as soon as it is seperated from the body?

they say
its reunion with the body, at the resurrection.
– In speaking of the pleasures & pains of the
soul in a separate state of existence, I
confine myself only to those pleasures and
pains, ~~it bad~~ which are derived from
impressions made on the body, for such of
them as are excited ~~by the action of the~~
~~divine spirit~~ by consciousness upon the mind are probably
as perfect in its separate ~~as in~~ state as they are
in ~~the~~ its connection with the body ~~for~~
this spirit acts upon the mind without the instrumen-
-tality of bodily impression, ~~upon the mind and~~ even while ~~the~~ it is
connected with the body. ¶ I return now to
speak of the ~~in~~ reflected action of the several
faculties of the mind upon animal life.
~~In favor of~~ In support of the last ~~opposition to~~ this
~~doctrine of a separate state of existence~~ opinion,
it is said, 1 That the soul & body were

of ardent Spirits compared with the stimulus of that of milk ~~Water~~, and vegetable Aliment. The influence of the Understanding and of the passions upon human life has been ascertained by many Observations. — Studious men who have not neglected all the means of health have generally been long lived. Witness Newton — Franklin — Wesley — Rollin — and a hundred others whose bodies for ~~years~~ more than half a Century were constantly under the stimulus of active & vigorous Understandings. The influence of the ~~bad~~ good passions ~~and~~ emotions in prolonging ~~vegetable animal~~ life has likewise been established by

both included in the sentence denounced
ag^t man after his fall. Viz: "Dust thou
art & unto dust shalt thou return". The
Divine Veracity, makes ~~the~~ death of the soul as well as the body.
2 That the demerit of Sin appears more
conspicuous in the death of the soul
as well as the body, more especially as
the soul ~~wasthe~~ reduced the body, and
was of course the first & greatest trans-
-gressor. 3 ~~The~~ It is said the perfection of merit of
the Christian System is more illus-
-triously displayed by the Doctrine of
the death of the soul; for it shews greater
power ~~of~~ to reanimate a dead soul,
than a dead body at the general Resurre-
-ction which is predicted & promised
in the Gospel. 4 turn over 5 It is said that the
time which is passed in the grave is
no longer than that which is required

many facts. Hope, love & joy are like oil perfumed with frankincense to the lamp of life. ~~I have not found many that~~ nor are there wanting instances of persons who have attained to an extreme old age, who have been subject to ~~[illegible]~~ more or less of all the evil passions, and emotions I have mentioned. Benjamin Lay who died above 80 was subject to anger - old Elwes to avarice - & many most in Europe furnishes examples of men who have lived to be very old, who have been constantly under the dominion of Ambition. In the course of a long inquiry into

to take place between Death, & the entrance of a Soul into a seperate state of existence. all consciousness of time being as much lost After death, as in profound sleep. who can tell when he wakes in the night, ~~what~~ or in a dark room in a morning, whether he has slept ~~a~~ ~~ten~~ a minutt, an hour, or six or seven hours? —

It is said that the death threatned upon Adam was simply annihilation, & that this would have been the fate of all his posterity, had not the gospel ~~defeated~~ repealed the sentence by ~~its~~ holding forth the promise of the Resurrection which strictly speaking brings ~~life~~ ~~light~~ life & immortality to light, by shewing that we are to

the history of old age, I did not find one person who had lived to be 80 who was ~~made the~~ not a person of an active Understanding or of active passions. Take notice here that to be salutary, they should be exercised moderately. In our Pathology I shall mention many diseases, & even some sudden & early deaths brought on by the intemperate exercise of the Understanding & passions. ~~I go great~~ I have only to add to this head, that ~~I~~ I can by no means admit with Dr Brown the ~~influence~~ principles of ~~the action of stimulus~~ on all, of any one of these powers of the mind, to be so essential to life as to act in sleep. On the contrary, I believe

live again. This view of the subject is comfortable, for as it shews the whole human race to be interested in the benefits of the resurrection, it proves that they will ultimately be interested in all the other blessings of the gospel.

6 In answer to those passages in the old & new testaments which speak of a seperate state of existence, they say that the sacred historians, prophets & apostles were inspired with divine, but not with metaphysical knowledge, & that it is no more wonderful that they should be mistaken on that point, than they should be carried away by the common, & erroneous notion of the sun's rising & sitting & standing still.

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the soul to sleep ~~in perfect~~ with the body in perfect health. It is true they all act in Dreams - ~~so~~ in which case they are certainly stimulating, but Dreams are a disease, & do not belong to our present inquiries, for I am considering the body now only in a healthy state. - Dreams like the so full gall bladder ~~in to~~ which attends an empty stomach, serve only to supply the ~~presence~~ want of some natural stimulus. - Hence the idle who neglect the stimulus of labor, or the luxurious who bring on indirect debility by excess in eating or drinking are most subject to ~~them~~ dreaming, & perhaps.

In answer to this opinion, & in favor of an immaterial or material principle existing in a separate state — go to p. ~~40~~ 40

~~To the effects of the passions upon animal life, I shall only add that the much has been ascribed to the influence of the will upon animal life, but as this faculty of the mind acts thro' the medium of the passions, it will not be necessary to add any thing further upon it.~~

~~In what ever manner this controversy may be decided, I still maintain the mind to be first passive before it becomes active, & that all its operations are as much the effects of external & internal impressions, as animal life, or as a certain sound of a Bell — or the effect of a stroke of a hammer. But more of this — hereafter.~~

this may be the final cause of Dreams. — I shall I hope presently more fully refute the necessity of admitting Dr Brown's idea of the soul's thinking in sleep. It will serve to illustrate the principles I have endeavoured to establish, to take notice of a symptom in acute diseases from which even nurses & old women augur a re=covery. — I mean a person ~~awaking~~ changing suddenly from that passive & tran=quil state of mind which attends the lowest ~~stage~~ stage of acute diseases, & suddenly becoming peevish & ill natured. The peevishness here is a gentle stimulus to the system, & often assists in bringing on a crisis of the disease. —

7 It is said ~~that~~ by Dr Haller & Dr Lemiard & others that intelli-
-gence has appeared in many persons
who have lost a large portion of their
brains. This ~~is probible~~ may probably
depend upon a translation of the seat
of thought - such as occurs in the
translation of the seat of the senses
formerly mentioned.

8 It is said ~~that~~ the mind continues
perfect & vigorous in old age & in the
hour of death when the body exhibits
every mark of decay & dissolution. The
same thing often occurs in the stomach,
& yet no One has said upon that act
that it ~~is~~ immortal, & that it ~~can~~ will exist
in a state of seperation from the body.
The vigor of the mind ~~in old & sick~~ & sick-ness
in old age, & just before death, depend
alike upon those parts being the

last retreats of dyspeptic excitement.

Should it be true that thought is merely effect like animal life of impression differing from it only in being confined to the brain, it would not surprise us more than the production of speech by the numerous motions of the glottis, tongue & lips. The idea so far from being unfriendly to just conceptions of the divine Being, exalts his wisdom & power in my opinion infinitely more than the creation of ten thousand worlds of matter devoid of motion & intelligence. Go to p: 407

V 9 Many of our mental pleasures & pains are seated in different parts of the body - Eg the heart is the seat of joy & grief - now we cannot suppose the soul to occupy both the heart & brain.